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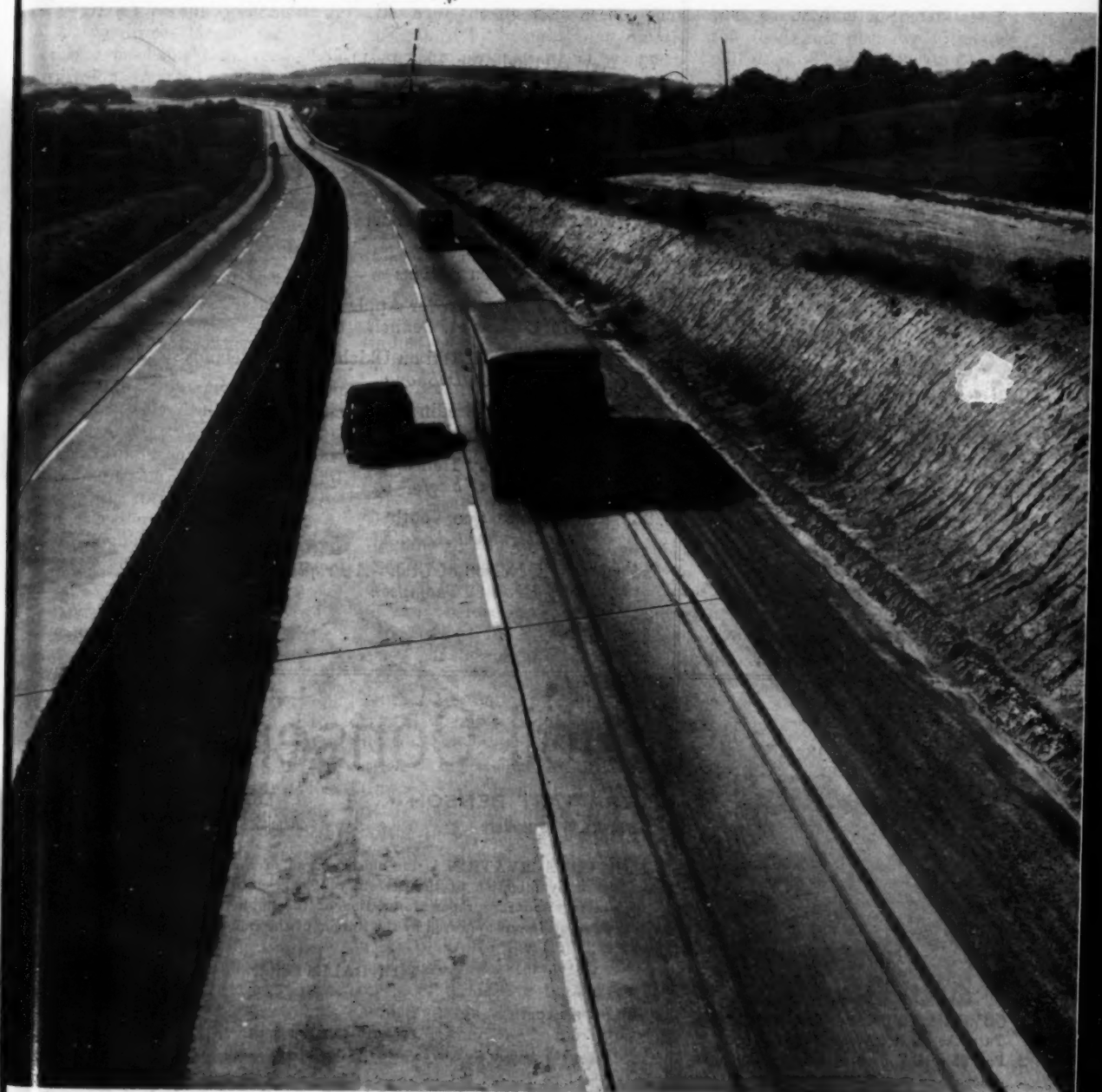
Soil Conservation



SOIL CONSERVATION SERVICE • U. S. DEPARTMENT OF AGRICULTURE

VOL. XXVI, No. 4 NOVEMBER 196

"If there is any activity of mankind that requires the most scrupulous use of all that conservation science and hydraulics can provide, it is the work of keeping our land permanently productive and making the best use of our water supply."
—HUGH HAMMOND BENNETT

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Soil Conservation

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TOM DALE, Editor

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New Methods for New Problems

By Donald A. Williams

TODAY'S rapidly changing agriculture—larger farms, increased mechanization, vertical integration, greater emphasis on management skills, and the shifting of farmland to nonagricultural uses —provides the setting in which we must carry forward the soil and water conservation job.

Never before in the 25-year history of the Soil Conservation Service have we faced more rapidly changing conditions or been called upon to meet more complex problems. Nor have we ever had such a wide variety of conservation programs and interests to weld together into an integrated program that effectively deals with all the problems.

The rapidly changing conditions and increasing complexity of soil and water problems demand dynamic leadership on the part of those responsible for formulating and carrying out our conservation program.

We have to measure tomorrow's demands on our agricultural resources, not in terms of today's abundant production, but in terms of the needs of the estimated 230 million people we will have in the United States by 1975, or the 370 million people we may have by the year 2010. The Agricultural Research Service recently pointed out that, in order to meet even 1975 demands, "we must devise production improvements 30 percent faster than we did during the fruitful 20 years preceding 1956."

A considerable part of the production improvements may be made by breeding better types of plants and animals, controlling pests and diseases, and by better plant and animal management practices. Some of the increase needed may be gained by bringing new or idle land into production or by converting producing land to more intensive uses. Still other gains may be made through improved processing, marketing, and distribution of agricultural products. But a great part of the increased food and fiber needed for our expanding population must be achieved by increasing the productivity of the land we are now using for these purposes.

The already keen competition for land and for water for agricultural, industrial, transportation, rurban, and recreational uses will become even greater. The land taken from agriculture for nonagricultural uses probably will continue to exceed the amount of new or idle land we bring into production through irrigation, drainage, or clearing. And in many instances the land we lose to nonagricultural uses will be some of our most productive farmland.

Never before have we seen such widespread—and growing—appreciation of the role of our soil, water, grass, timber, and wildlife resources. Thinking people in all walks of life rapidly are coming to the realization that most of the great developments of our time ultimately could be meaningless if we do not maintain our resource base.

But these thinking people want to know what conservation means, not just in terms of combating erosion and preventing other types of soil deterioration, but in terms of wiser planning for the use of all our land and water resources—in terms of expansion potentials for industry, for transportation, for recreation, and for living room for the rapidly growing population as well as production potentials for the food and fiber we ultimately will need. They are looking to the Soil Conservation Service, the soil conservation districts of the Nation, and other conservation agencies to supply the answers for these problems and to furnish the leadership required to solve them.

Obviously, the methods for dealing with soil and water and related resource conservation are having to be broadened to deal with these new problems. This is not to say that the basic principles of conservation are changing. The concepts on which the program of this Service was founded more than 25 years ago are still valid. The concept that land varies from field to field and that it can be classified as to its capability and needs and so used and treated is still valid. The idea of treating entire farms and ranches and entire watersheds as units is still valid. The assumption that soil conservation and water conservation are inseparable phases of one program still holds. These and other basic principles were the foundation stones of the early programs of the Service and still serve as such.

But the electronic, atomic energy, and jet-propelled age is with us. And with it has come a worldwide population explosion. These developments bring not only new, diverse, and complex problems; they also bring us rapid advances in science and in our abilities to apply new scientific discoveries to the jobs at hand. An important part of our future job must be to take advantage of these new scientific findings. If we fail to do this, we will fail to carry out our responsibilities.

ZONING TO PROTECT AGRICULTURE

Rural zoning can be used for or against farmers, depending on the purposes for which it is used. Farmers in California have learned to use zoning to the advantage of agriculture and the community as a whole. New kinds of zoning districts and regulations, including exclusive-type agricultural zoning districts, have been developed.

By Erling D. Solberg

It once was an attractive and productive farm. It bore a proud name. Soils were fertile, fields and pastures were terraced and well tilled. Ponds and streams were clear. Buildings and fences were in good repair.

Today it is part of a rurban sprawl—a scattered, mixed development that is neither town nor country. Strings of houses commingled with stores and weed-grown lots border the roads. There are gas stations at the crossroads. Other houses are widely scattered among the remnants of fields that did not sell. Some of these fields, now idle, have reverted to weeds and brush. Soil erosion is prevalent.

The change began when the owner sold his front lots. The prices received were high compared with the value per acre of the farm as a whole. Houses were built. Later, other farmers sold their frontages. The change continued as the years went by. Growth was haphazard. Many farms were bypassed and "trapped" in areas that are largely urban. Subdivisions farther out became residential islands.

Rurban sprawl can be found in most of our States. It is a byproduct of rapid, unguided community growth. Sprawl is a prolific producer of problems that are left behind as unwelcome legacies for the community, for the new suburbanites, and for the remaining farmers.

Note:—The author is agricultural economist, Agricultural Research Service, Washington, D. C.

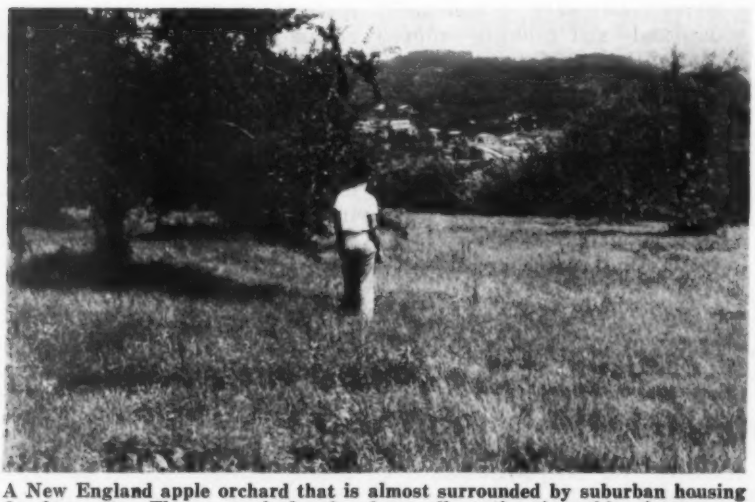
Farmers in unzoned rurban areas may be forced to help pay for additional community centers such as this, schools, and other public services needed by their new urban neighbors.

Sprawl inflates taxes for farmers and nonfarm residents alike; it increases the cost of providing the needed roads, schools, and other public facilities and services.

Sprawl wastes farmland. Preliminary estimates indicate that every time unplanned urban growth converts an acre of farmland to urban uses, it wastes, on the average, three more agricultural acres. Two of these acres go out of farming into a ripening stage for possible later nonfarm uses. The other acre remains idle.

If in addition to rurban sprawl there is an unwise mixture of land uses — agricultural, residential, commercial, and industrial—serious conflicts between incompatible land uses may result. From the viewpoint of farmers who continue to farm in the area, these conflicts may be separated into three groups.

First, there is a shifting to farm taxpayers of development and pub-



A New England apple orchard that is almost surrounded by suburban housing developments. The owner had refused to sell at the time this picture was made, but the price of land around him was getting higher each year.

lic service costs, among which are outlays for new roads, streets, schools, parks, water mains, sewers, and other public facilities and services. Farmers now have, and have paid for, many extra public facilities that are needed by their nonfarm neighbors, but which the farmers neither need nor want.

Second, there are adverse effects of nonfarm land uses that damage the agricultural plant and operations. These include the diversion from agriculture of the most level, the least erodible, and the most fertile land. Rurban expansion often takes such highly productive land first, even when other suitable land is available for nonfarm uses.

Other urban-induced damages result from depletion and pollution of ground waters; more frequent flooding of farmlands because of rapid runoff from roofs and streets; pollution of streamflows; injury to crops because of air pollution; and trespass hazards, particularly at harvest time.

Finally, problems are created because of objections of nonfarm people to certain normal farming activities. There are objections to smoke from smudgepots, spraying and dusting of tree and field crops, noise and dust from farming activities, and unpleasant odors and flies from livestock and poultry operations. These objections may result in the regulation of farming and feeding practices by health authorities.

What of the future? A growing population and better roads and more cars promise a wider distribution of population.

Population estimates for 1975 for the continental United States range from a low of 207 million to a high of 230 million. Estimates for the year 2000 range from a low of 261 million to a high of 361 million people.

Express highways built within the next few years will extend commuter zones. Space must be found for community growth, for

Sherman F. Gold, of Abingdon, Va., stands on a 3-acre homesite he has just purchased at an auction when a 135-acre farm was divided into 45 homesites. This development is in Washington County, Va., far from any large industrial or population center.

new homes, for business centers, and for industrial sites. Does this mean more rurban sprawl with its waste and its land use conflicts? Or can there be a more orderly community growth, perhaps with surburbias and farms side by side?

A workable solution has been effected by many burgeoning communities. They use planning and zoning tools to keep apart land uses that are likely to conflict. First, an overall plan of optimal land use is prepared. Then separate districts are established for agriculture, for residences, for business, and for industry.

Agricultural zoning districts may be grouped into three main classes.

Those of the first class enclose agricultural areas from which objectionable business and industrial activities are excluded. In these agricultural zoning districts, all kinds of farming activities, except hog farms for feeding garbage and offal, are usually permitted. Also allowed are farm and nonfarm residences, home occupations, schools, churches, and other facilities that are appropriate in residential districts. Other uses that are sometimes allowed are plants for processing and storing agricultural products, earth extraction industries, public utility facilities, and airports.

Most other uses and activities are prohibited in these farm zoning districts, especially wrecking yards, taverns, public dance halls, automobile courts, and trailer camps.

In the second class of farm zoning districts, essentially the same kinds of regulations are applied, with one important exception—the requirement of large minimum lot or tract sizes. Minimums ranging from 1 to 5 acres or more are required at times to discourage residential development and to reserve the land in these districts for agriculture.

In order to further these objec-

This formerly was a prosperous apple orchard in New England. It still is surrounded by dairy farms and orchards, but the future land use pattern is unpredictable because of a lack of local planning and zoning.

tives, the minimum size of tract must be large enough to discourage purchase for residential development, and to serve the primary purpose of the district, which is agriculture. Many types of farming require only a few acres.

In farm zoning districts of the third class, a more direct approach is used. Within these districts, only agriculture, a few related activities that further the use of land for farming, and certain public and semipublic uses are permitted. All other uses, including nonfarm residences, are excluded. As an added safeguard, minimum tracts of up to 10 acres are required.

California farmers have been especially pressed by rurban expansion in recent years. In self defense, they developed the third class of district described—the exclusive-type farm zoning district.

The primary land use in exclusive agricultural districts is farming. Other permitted uses are secondary and accessory. Residences, for example, are allowed as accessory uses to permitted agricultural uses.

Zoning regulations applied in exclusive-type farming districts are designed and used to protect agriculture. Land uses which require additional roads, schools, utilities,

Superhighways, such as the New Jersey Turnpike shown here, may consume large amounts of the best farmland, divide farms into uneconomic units, and cause other major inconveniences unless proper planning and zoning precede construction.

and other expensive public facilities and services are excluded. The same excluded land uses have been the main source of the objections voiced against normal farming practices and the main reason for conversion of fertile soils to nonfarm uses.

A dozen or more counties in California have created exclusive agricultural districts to protect a variety of agricultural areas. These include areas in orchards, truck crops, and general farming, and areas used for dairying, poultry raising, and nurseries and greenhouses. The districts differ from each other, and the regulations applied vary with local conditions and needs. Districts range in size from a 35-acre zone used for growing field and greenhouse flowers to a district that contains 175 square miles and is devoted to several types of farming.

Agricultural zoning districts usually do not call for regulation of farming activities. Instead, conflicting nonfarm uses are excluded.

Exclusive-type farm zoning districts are established on petition by the farmers concerned. Before final action by the county board, careful studies are made, the recommendations of the local planning agency are submitted, and public hearings are held.

Productivity of soils is a major consideration in zoning land for agriculture. There is little point in reserving the poorer soils for agriculture.

When alternate lands of differing soil capability are available, and both are suitable for development for nonfarm uses, the community has a choice.

Benefits from reserving the better soils for farming will accrue to both rural and urban people. Benefits will go to people on the land from having an efficient and highly productive agricultural plant.

Other benefits will accrue to the community at large. Agricultural greenbelts can break up continuous urban development, lower overall population densities, and reduce pressure on travel arteries and on other public facilities. Other benefits may result from reducing runoff, avoiding flood damages, reserving natural storm drainages, protecting watersheds and wildlife, and by avoiding sprawl-inflated costs of public services.

A technological revolution, along with a population explosion, is carving new frontiers in rural communities. New urban forms are being shaped. Yesterday's sharp separation between town and country has been blunted. Farmers and city folk are now neighbors. Ways must be found to permit farms and suburbias to prosper side by side.

Factories and office buildings are moving to rurban areas at an accelerated pace. Unless proper planning and zoning are done in advance, such movements may severely disrupt the agricultural economy of an area.

Healing a Gully

By T. J. Davis

Large gullies on the J. F. Taylor farm, near Holdenville, Okla., got their start from emptying terrace water onto unprotected outlets. The terrace system was redesigned by SCS technicians assisting the Hughes County Soil Conservation District, and the gully scars were healed in one season by shaping the banks, fertilizing, and planting to bermudagrass.

Note:—The author and photographer is work unit conservationist, Soil Conservation Service, Holdenville, Okla. This sequence of pictures was given an award as the best photographic essay submitted by SCS employees in Oklahoma during 1959.

April 23, 1958.—The owner looks at the gullies.

May 14, 1958.—Shaping the gullies.

Aug. 3, 1958.—Fertilized and planted to bermudagrass.

Dec. 19, 1958.—A good grass waterway.

ARS and SCS use

Portable Hydraulic Channel

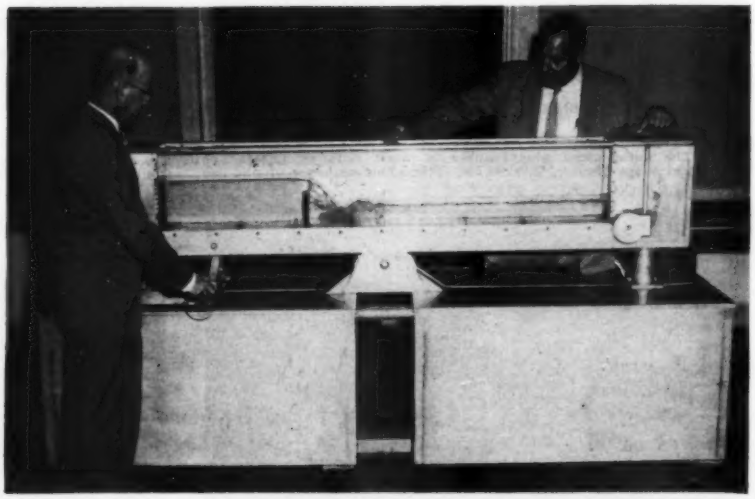
for demonstration and training

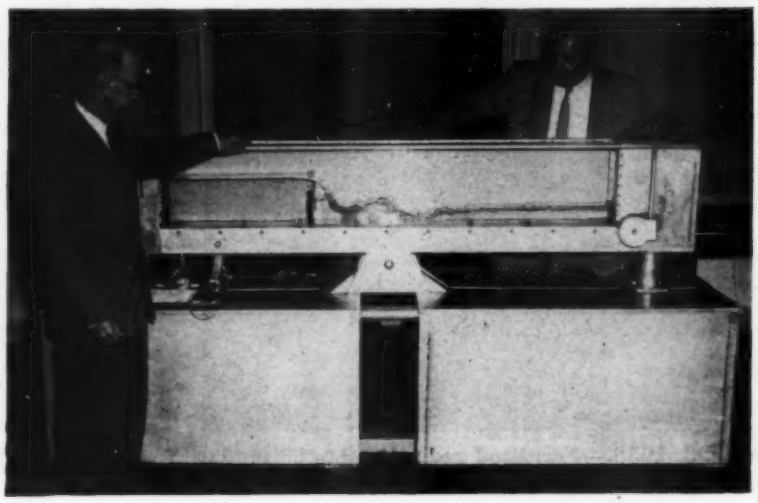
A miniature hydraulic demonstration channel, developed at the St. Anthony Falls Hydraulic Laboratory in Minneapolis, has been used extensively there for demonstrating various types of hydraulic structures. More recently, similar model channels have been built and are being used at SCS training centers to demonstrate to Service employees some of the principles of hydraulics and the effectiveness of different types of hydraulic structures.

The model is a simulated stream channel about 6 feet long and 6 inches wide mounted on a frame above water tanks. The channel may be tilted to a slope of 10 percent or more. An electric pump circulates water from the tanks through the channel at any desired rate. More than 20 different types of hydraulic structures have been built to fit in the channel and may be used singly or in various combinations for demonstrations.

The performance of water flowing through or over the various structures in the demonstration model is quite similar to the performance of water in full-sized field structures. This is the chief value of the miniature models for testing purposes; they permit numerous tests of varied modifications of a structure with minimum cost and labor.

The channel and hydraulic structures for the demonstration model are made of transparent plastic. This permits visual observation of water performance, and greatly enhances the value of the model for demonstration purposes. The frame and water tanks are constructed mainly of aluminum. The entire model is mounted on wheels for





Fred W. Blaisdell (left) and George N. Osterson operate a hydraulic demonstration channel to show SCS employees how different hydraulic structures function. *Above*: Straight drop spillway stilling basin developed at the St. Anthony Falls Hydraulic Laboratory. The water flowing over the spillway falls onto a horizontal apron where the energy is dissipated by blocks. The water is discharged into the downstream channel in such a way as to prevent damaging scour. *Below*: Wisconsin Notch spillway stilling basin, one of the structures tested that proved unsatisfactory. Two transverse sills across the apron were supposed to dissipate the energy of the falling water; but as the flowing water hits the first sill it bounces and falls beyond the second sill. Some energy is dissipated by the sills, but not enough to prevent serious scour in the downstream channel.

easy movement. The electric motor may be operated by plugging into any 115-volt circuit.

Duplicates of the St. Anthony Falls demonstration channel now being used at SCS training centers are at Coshocton, Ohio, Athens, Ga., and San Luis Ibispo, Calif. About 600 employees of the Service will observe demonstrations of the performance of the 20-odd structures in these channels during 1960. Present plans provide for eventual installation of hydraulic demonstration channels in Service training centers at Stephenville, Tex., and Fort Robinson, Nebr.

The SCS training centers at the five locations provide training in the basic principles of soil and water conservation for all new employees, both professional and subprofessional. In addition, many special sessions are held for engineers and advanced conservation or engineering aids. The hydraulic models are a valuable training aid used in all these sessions to demonstrate engineering principles as well as the importance of research and how it supplements the field program.

Special demonstrations were given to Washington employees of the Service during June, when one of the channels was brought to the Department of Agriculture for that purpose. During these demonstrations, the model channel was operated by George N. Osterson of the SCS training center at Coshocton, while explanations of the phenomena observed were given by Fred W. Blaisdell, hydraulic engineer of ARS at the St. Anthony Falls Laboratory.

Mr. Blaisdell, who is the supervisor of ARS operations at the St. Anthony Falls Hydraulic Laboratory, is the principal designer of this unique and valuable demonstration model. He has spent many years on hydraulic research, formerly with SCS and with ARS since 1954.

The ARS research at the St. Anthony Falls Hydraulic Laboratory is conducted cooperatively by the Agricultural Research Service and the University of Minnesota. Its principal functions are to develop and test hydraulic structures useful in soil and water conservation. Many types of structures developed or tested at the laboratory are now used extensively by SCS engineers and others engaged in water management or conservation. They also are being used more and more by State conservation engineers, highway engineers, and others who have problems of design for small or medium-sized water control structures.

A New Hustle

SCS Supervisors in Texas Profit from Management Training

By Tarleton Jenkins

THE local ball club was having a good year, the best the home fans could remember.

Every player showed he was giving his best on every play. No game was won by an opposing team until the final out.

Why? Everybody agreed on the reason. Management, they said. Under the new manager, there was a different atmosphere, a new sense of team relationship and spirit. There was a new, never-give-up kind of hustle.

Somehow, folks said, the new manager of the team had imparted the enthusiasm and loyalty, both to his players and to the "front office," which he himself obviously felt.

Throughout the Soil Conservation Service, a determined movement in this direction is paying off with the same results.

It is management training. The "managers" of the local "teams" or units are brushing up on the principles of winning combinations of people and ways to get a better job done.

There are no real tricks, no magic formula. Most of the training consists of reviewing the ways in which successful supervisors in business, industry, government—or in ball clubs—go about their supervision.

In Fort Worth, Tex., I looked in on one of these management training sessions. It was principally a series of roundtable discussions, with area conservationists taking the lead. Present were some 25 unit leaders, many of them real veterans of Soil Conservation Service technical help to soil conservation districts.

N. P. Stephenson, training officer for Texas, set the theme with the Galileo quotation, "You cannot teach a man anything. You can only help him find it within himself."

When State Conservationist Henry N. Smith approved a man-

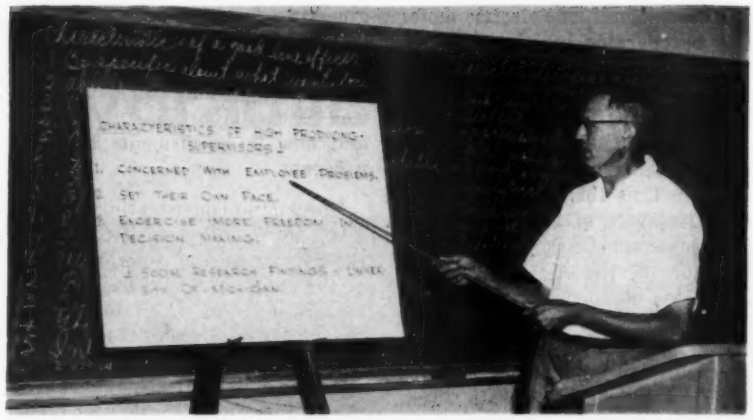
Note:—The author is information specialist, Soil Conservation Service, Denver, Colo.

agement training program for supervisory employees of the entire State, Stephenson set out to organize the course for the work unit conservationists. He scheduled 18 sessions.

Into the trainees' notebooks at the Fort Worth session, under the topic "Characteristics of High Producing Units," went such notes as: High group loyalty, effective communication, latitude to set own pace, supervisors self-confident and secure.

Under "Facts That Help Us Understand People," were penciled: A worker produces no more than he wants to produce; people use less than half their capabilities; personality failures account for twice as many job failures as lack of technical knowhow; all people have breaking points physically and psychologically; the majority of people are basically honest and want to please; people fear what others think about them; and we understand others only as we understand ourselves.

Area Conservationist James Abbot of Lubbock pointed out that a work unit conservationist's staff is his primary resource. But he also has a tremendous resource in people outside his staff. Production often depends on the amount and



Training Officer N. P. Stephenson leads a discussion on what it takes to become a high-producing supervisor.

effectiveness of supervision. A work unit conservationist's job is broken down three ways: organization-dictated—the activities required by SCS as an agricultural agency; job-dictated — immediate day-to-day responsibilities; and self-dictated—the reading and training courses for improvement, the analysis of methods and procedures for greater efficiency, and the relations work done.

In the matter of dealing with other people, the group recognized that psychological needs are just as impelling and real as physical needs. People need, and respond to, recognition (as a personality to be seen and noticed); to understanding; to an awareness of being appreciated; to the chance to use capabilities to the fullest; and to acceptance by co-workers, superiors, and subordinates.

Some of these needs are more important for some people than for others. However, the needs are governed by laws just as unyielding as those governing physical needs. Without satisfaction of them, people may become anxious, tense, indecisive, and incapable of action. Quarreling, criticizing the boss, malicious gossip, insubordination, moodiness, and a "whipped dog" attitude—these may be the consequences of frustration in the job.

The group developed a check list for supervisors, with score points, which included:

Are my personal habits above reproach, do I have a good knowledge of the work to be done, am I dependable, do I accept criticism, do I use common sense, am I loyal to SCS, am I courteous, do I assume authority when necessary, is my personal appearance exemplary, do I take advantage of opportunities to improve myself?

The group agreed that the new employee's first day on the job is an important one. Here is a chance to put some of the principles of

Around the room were 25 SCS veterans, "managers" of as many work unit teams. Their "place cards" were shifted twice daily to promote fellowship.

good supervision into action. The new employee should meet the rest of the staff, get a pleasant introduction to the community, have a chance to get agreeably settled, and have a call by the supervisor on the new family in town. An announcement in the local paper of the new member of the unit may seem unimportant, but it is the kind of morale booster that can help get a new man off to a good start.

The work unit leaders had fun with a demonstration of the difficulty and importance of clear communications Using a one-way telephone, one member of the group sought to instruct another in the next room in the arrangement of a dozen dominoes on the table in front of him. The second member could not ask for clearer information in any instance. Comparison of the second domino arrangement with the first got a real laugh (see pictures at right). The demonstration had served its purpose.

There was intense interest in the factors involved in high production as shown in a study of a group of workers in an industrial plant. The workers had been on a 48-hour-week shift. Put on a piecework basis, production went up a little. Given two five-minute rest periods, production again showed a slight increase. Longer rest periods—still an increase. Hours were reduced and free lunches started. Output still went up.

Then the worker group went back to the old schedule: 48-hour week, no rest periods, no piece work, no free lunches, no Saturday holiday. Production surprisingly went to an alltime high, a sustained 25-percent increase over the base period rate.

What was the explanation? This was the analysis: The original conditions in the experiment had disappeared. The scientists conducting the study had created a new and friendly world among the worker group, giving the workers a new sense of accomplishment and contribution. The change was purely psychological, but they had a new sense of their value as workers, as members of the team. Their attitude toward their job had changed.

Jack McFarran of Gainesville (upper picture) gives instructions over a one-way telephone to Frank Duncan of Vernon (center) on how to arrange 12 dominoes in the same pattern as those before McFarran. Duncan is not permitted to ask questions. (lower) Duncan and McFarran examine the two groups of dominoes to see how well their one-way communications worked.

The training session was a most fruitful one for a group of men whose use of human resources, day after day, means so much in the overall conservation job in 25 soil conservation districts.

James Coppedge, veteran work unit conservationist at Denton, leaned back and grinned.

"You know," he said, "I've just got an awfully different picture of an old boy named Coppedge."

And another of the group appraised it this way:

"As a result of this I am sure I can be worth considerably more as a supervisor, an employee, a citizen, a husband, and a father."

This training is paying off in improved work performance. One area conservationist summed it up this way: "One of my work unit conservationists was nervous every time someone from the area office went into his work unit. His staff had no guidance. He griped about all the work someone should have done; he felt sorry for himself. He attended a management session about a year ago and today he is a different person. He has gained confidence, is doing a good job supervising his staff, and recently turned what could have been a mess into a good thing by working tactfully with another agency representative. This would not have been the case a year ago."

It is a good bet that, across the Nation, a new spirit is taking hold in many a Soil Conservation Service team. Its trademark is a new hustle, keyed by a few simple yet important principles learned by team "managers" in training sessions like the one in Fort Worth.

•

The Pennsylvania Department of Agriculture reports that the flooding Susquehanna River carried the equivalent of a 40-acre farm past Harrisburg every 6 hours between March 31 and April 8. The report is based on information collected by the Geological Survey which shows that nearly 2 million tons of sediment moved past that city during the 9-day period.

DRAGLINE IRRIGATION
For Apple Orchards

By William A. Bennett

BLAINE Madden and Cal Cooper are proving that dragline sprinkler laterals can be used in their orchards near Pateros, Wash.

Cooper and Madden had seen wheel-move and dragline laterals used on hay and pasture crops and were determined to give the dragline a try in their orchards. They contacted the South Central Okanogan Soil Conservation District for assistance in designing a sprinkler irrigation system for the 40 acres of young, hardy trees.

An SCS technician assisting the district designed the system. It was installed in the spring of 1959. The hydrant valve bases on the main water line were installed below ground level so that farm machinery, and particularly the dragline laterals, could pass over the hydrants without causing damage. Eight-inch concrete pipe was slipped over the valve bases flush with the ground to give further protection against damage from farm machinery.

The permanent trees in the orchards are planted on 28½-foot squares, adequate spacing for the semi-dwarf trees. They have planted filler trees in the centers of these permanent tree spacings, which makes a distance between rows of only 14¼ feet. Each orchard, rectangular in shape, is about 880 feet wide (east to west) and 1,320 feet long. The main water lines run underground down the center of the orchards, north to south.

Note:—The author is engineering specialist, Soil Conservation Service, Okanogan, Wash.

End of a dragline lateral hitched to the drawbar of a jeep. Note the nut welded to the side of the pipe, which slips into the slot on the angle iron to give stability to the line while moving.

Blaine Madden points out the S-curve in a dragline as it is pulled by a jeep from one set to another.

The dragline laterals are 440 feet long and made of 2-inch, 14-gage steel pipe with welded joints. Cooper and Madden believe that they will be able to use the dragline laterals indefinitely in the orchards since they have semi-dwarf spur-type trees. They believe that trees with these growing characteristics will need very few props, and the few that will be needed can be located to allow the jeep and draglines to pass freely down the rows. Two rows of filler trees were left out along the main lines to facilitate moving between the rows.

The laterals are designed to operate 12 hours at each set. After the irrigation period, the lateral is

connected to a drawbar on a jeep and pulled to the other side of the main line for the next set. Each time the main line is crossed, the lateral moves up one row, or 14¼ feet. This gives a 28½-foot spacing between sets.

The most important part of the moving operation is to get a good S-curve in the initial 25 to 30 feet when the lateral is pulled between rows. After that, the lateral will track right along behind the jeep, snaking its way between the tree rows.

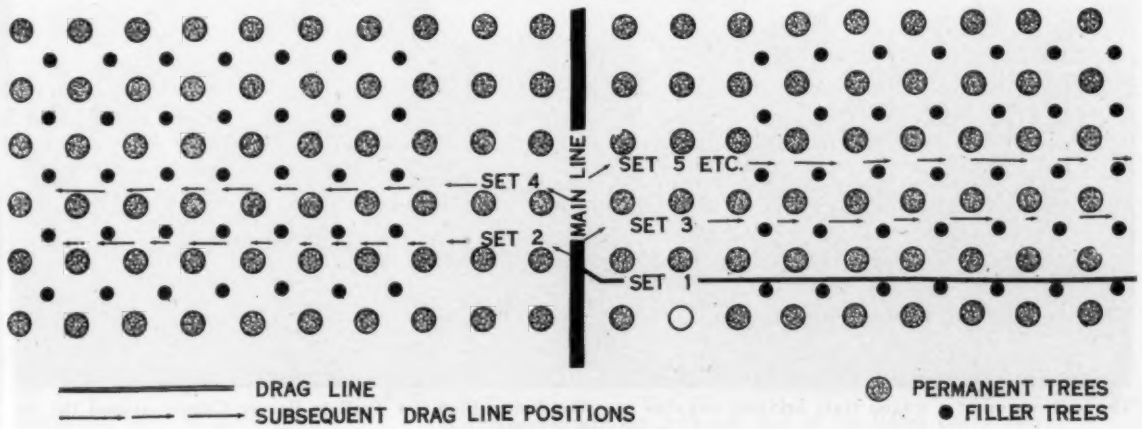
The hitch used is a simple one. Triangular notches were cut out of two sides of the end of an 8-inch piece of channel iron, which is bolted to a drawbar on the jeep. Two steel nuts, welded near each end of the dragline, fit in the notches of the channel iron. This connection lets the lateral be pulled forward and also keeps the lateral from tipping. No stabilizing device has been necessary for either the moving or sprinkling periods. Aluminum pipe with rubber elbows is used to connect to the hydrants so that the laterals won't have to be stopped at an exact spot to hook up.

Each orchardist has three laterals and their orchards are located side by side. When, in its cycle, one of the laterals reaches the north end of Madden's orchard, it is moved to Cooper's orchard, laying to the west, where the cycle is continued. Likewise, when one of the laterals reaches the south end of Cooper's orchard, it is dragged over to Madden's orchard. This is a very important factor; that these two orchards are side by side so that the laterals can be traded back and forth after they have reached the end of one of the orchards.

It takes approximately 25 minutes for each man to move the three laterals in his blocks. This means that by using the dragline laterals instead of conventional portable aluminum lines they save about 2½ man-hours per day while irrigating.

Madden completes the connection of the dragline to the main water line with a 12-foot length of aluminum pipe with rubber elbows.

Diagram of dragline operations on the Madden and Cooper farms.



New Wealth and Old–

on Oklahoma's Tablelands

By Bernice DeShong

THE "oldtimers" of Beaver County Oklahoma's Plains country, who have watched the stages of progress from the wagon train to the oil well, are becoming fewer and fewer with each passing year.

Soon, only the marks of progress on the landscape will be able to tell a first-hand story of the growth of Oklahoma's tablelands.

It was well over a half century ago that the long wagon trains from Kansas wended their slow and dusty way over the James Plummer Trail into Beaver County.

Judge Otto Barby was one of those early settlers who came to the Panhandle a decade before the turn of the century when it was "No Man's Land," and claimed a homestead.

As school land became available for lease, he added to his holdings; and as some of the less hardy settlers moved away, he added still more.

In 1924, the ranch was organized as Otto Barby and Sons. The sons were Ralph, Otto Jr., and Lloyd. The ranch grew to 80,000 acres.

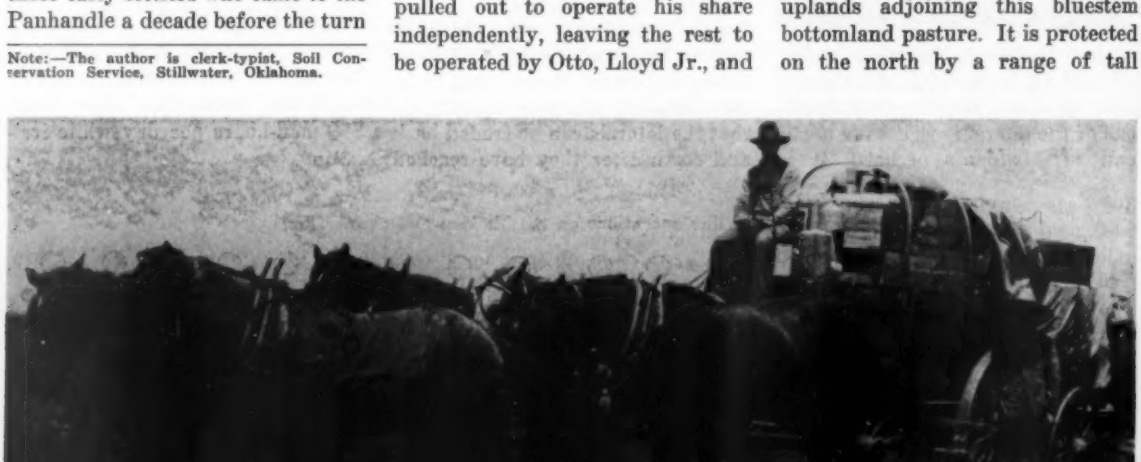
The elder Barby died about five years ago, and Lloyd—who was chairman of the district board of supervisors—died a year later.

The ranch was kept as a unit until two years ago when Ralph pulled out to operate his share independently, leaving the rest to be operated by Otto, Lloyd Jr., and Mrs. Lloyd Barby.

As you approach the Ralph Barby Ranch from the south, you come to the Beaver River. In the old days, this was a treacherous, sandy stream that had to be forded, and you had to be careful to avoid the quicksand spots when you crossed it. Now a modern bridge spans the river. As you turn into the lane leading to the ranch house and headquarters, you can look out across a wide expanse of Beaver River bottomlands, covered with lush bluestem grasses in the spring and summer and dotted with whiteface cattle.

The ranch house is located on the uplands adjoining this bluestem bottomland pasture. It is protected on the north by a range of tall

Note:—The author is clerk-typist, Soil Conservation Service, Stillwater, Oklahoma.



The lead wagon of a wagon train bringing supplies over the James Plummer Trail to Beaver County around the turn of the century.

Ralph Barby and part of his Hereford herd in a rejuvenated pasture where grass growth is now superior to that existing at the time of settlement.

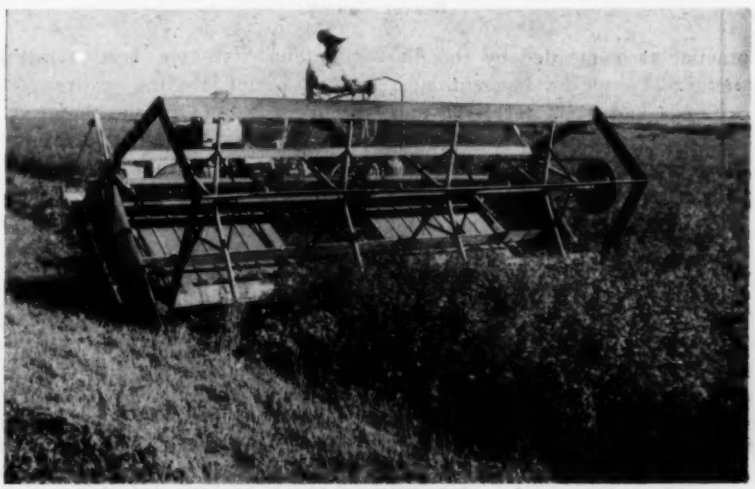
sand hills which take the force out of the wintry blasts of the Plains country; and in the spring these hills are covered with wild flowers, green patches of skunk brush, and wild plum thickets.

Ralph Barby, who operates 40,000 acres and runs 1,500 cows, calls his Beaver County Ranch "just an ordinary cow outfit." However, by the measuring stick of both quantity and quality, the Ralph Barby ranch is much more than an "ordinary cow outfit"; and Ralph Barby—long interested in cattlemen's problems, and president of the Oklahoma Cattlemen's Association—is much more than an ordinary rancher.

In addition to the ranch's well-managed native grass, there are 3,000 acres that are used as supplemental pasture and to grow feed for the cattle. About 800 acres of wheat are grown each year, primarily for pasture, but a grain crop is harvested if the season is right. Other feed crops are cane, hegari, and sudangrass. The sudangrass is used mainly for summer pasture and hay. A good part of the cane and hegari is cut and windrowed in the field. The cattle eat from the windrows, and only enough is baled for late winter use, usually about 400 tons.

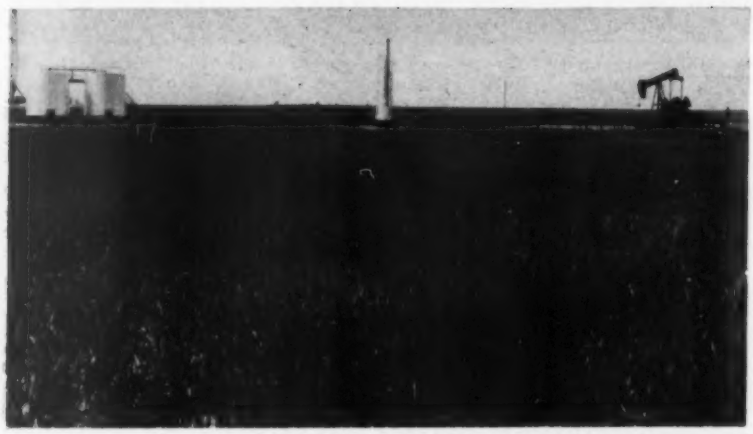
Barby is a "conservation rancher," as evidenced by his fine pasture and range land, well-kept cultivated fields, and the abundance of wildlife throughout the ranch. There are turkey, deer, quail, and pheasants, and often you will see the old familiar prairie chicken which used to be so common in this Plains country.

Barby was one of the first in Beaver County to make use of the services of the soil conservation district. When the Great Plains Program got underway two years ago, he was quick to see the advantages offered, and signed up as a cooperator. His Great Plains contract calls for nearly every conservation



Harvesting alfalfa on irrigated land of the Ralph Barby ranch.

A self-propelled combine harvests wheat on the Ralph Barby ranch.



Oil and gas wells are now found in many of the wheat fields and ranges of Beaver County.

practice recommended by the district. Stockwater developments such as ponds and wells, terracing and diversion terraces, reseeding of rangeland by the new improved method of furrow drilling, contour farming, stubble mulching, and the planting of shelterbelt trees for windbreaks and protection have all been incorporated in his Great Plains plan.

The Barby Ranch is "big business," but it is not operated from a desk. During cattle running time, it is a common sight to see Barby riding his Palomino horse, bringing in cattle to the loading chutes. He maintains well-kept headquarters, corrals, and loading chutes; it is a working ranch, however, and all facilities are made for service just as they have been through the years. Cattle trucks have largely replaced the long cattle drives. Most of the cattle are loaded on trucks and transported to the corrals for branding, dehorning, or shipment.

The main product on the Barby ranch is high-quality calves. However, he produces some fed cattle and some purebred Herefords for breeding stock, with an occasional bull which he will sell to a neighbor.

With Barby's well-earned reputation for high-quality calves, there isn't much of a marketing problem on the ranch. Calves are sold at the ranch, the whole crop frequently going to one buyer.

In the old days, the only sounds to be heard in Oklahoma's Plains country on a still night was the dismal wail of a coyote, or the mournful singing of a cowboy as he rode the range. But the Old West has undergone a "face-lifting." Mixed with the Old West's familiar sounds now can be heard the constant purr of the motors pumping gas and oil from down deep in Oklahoma's tableland. In many respects this has been a boon to ranch operations by supplying new capital and wealth to the area. Among other things, this modern trend has produced better roads which permit travel all seasons of the year.

Yet, present-day ranchers, as did the pioneers, still recognize the importance of grass in their economy. District cooperators in the Panhandle counties—Beaver, Texas, and Cimarron—are taking advantage of cost-sharing available through the ACP, Conservation Reserve, and Great Plains programs. To date, 245,155 acres have been seeded to grass.

The few "oldtimers" that remain in Beaver County have seen a lot of progress in the last fifty years, progress that justifies the faith of the pioneers in Oklahoma's "Heaven's Tablelands."

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More than 16,000 Certified Tree Farms in the United States in 1959 were growing more than 51 million acres of trees, according to American Forest Products Industries. During the 1958-59 planting season more than 2 million acres were planted to trees.

Alternate-Row Seeding of Grasses and Legumes

By Herb Boddy

MORE and more Pacific Coast dairymen like the results they're getting from alternate-row seedings of grasses and legumes.

The alternate-row technique holds real promise for pasture builders whose old broadcast seedings and mixed seed drillings haven't paid off too well.

Some legumes and grasses grow well together and some don't. Alternate-row seeding means that hard-to-start legumes and those that don't compete too well with grasses grow in their own row. Given more space, legumes get off to a good start and keep on growing right beside neighboring rows of grass.

Washington and Oregon farmers who use alternate-row seedings say the method turns out more feed, hay, humus, and fertility plus a better balanced ration for cows.

Milk and butterfat yields of many dairy herds dip and waver when legumes fail to keep up with faster-growing, take-over grasses.

Take birdsfoot trefoil, for example: When trefoil is seeded with grass, poor stands often result. And when trefoil is seeded alone, weeds and weedy grasses are the rule. The same is true of legumes like alfalfa.

Robert MacLauchlan, SCS plant materials specialist with headquarters in Corvallis, Oreg., has helped many dairymen and farmers seed the alternate-row way.

He says, "Putting legumes in one row and grasses in another cuts down competition between the two species.

"Farmers tell us they get good results from such seedings and our field checks bear this out.

"Farmers west of the Cascades find it hard to keep good stands of alfalfa or birdsfoot trefoil with a grass for more than two or three years. These legumes should be deferred in the spring for silage or hay. But the slower-growing legumes can't keep up with the more vigorous grasses in the cool, wet spring. It's a different story when grasses and legumes are planted in alternate rows.

"Results of five years of trials at the former SCS nursery at Bellingham, Wash., showed three times as much lotus in an alternate-row Cascade lotus and grass seeding as in a mixed planting of competing lotus and grass.

"Grass gives fields added protection against erosion, and perennial

Note:—The author is information specialist, Soil Conservation Service, Berkeley, Calif.

The first cutting, each season, of alternate-row-seeded Cascade lotus and Alta fescue on this farm is taken for silage. Later cuttings will be harvested as hay or for lotus seed.

grasses like Akaroa orchardgrass and Alta fescue add tilth and body to soils. Alternate-row stands of Alta fescue and alfalfa produce about twice as many roots as alfalfa planted alone."

So far about 100 successful alternate-row seedings have been made in 35 soil conservation districts in western Oregon and Washington.

Carroll Ellison, who runs a 60-acre dairy in the Mt. Angel Soil Conservation District, Marion County, Oreg., is happy about the gains he's made from alternate-row seedings.

A 1954 Grassman-of-the-Year winner in the Clark-Skamania SCD in southwest Washington, Ellison changed over to alternate rows soon after he moved his 17-cow herd to Mt. Angel three years ago.

"My pastures were really run down when I moved on," he recalls. "The clovers I broadcast-seeded lasted only a year or so and I soon had a sod-bound pasture.

"In 1957 Mel Rigdon of the Mt. Angel SCS office began helping me work out my problems. Following his recommendation, I seeded 21½ acres in alternate rows. The seedings included 5½ acres of Cascade lotus and Alta fescue; 6 acres of alfalfa and orchardgrass; and the rest in orchardgrass, Ladino clover, and New Zealand white clover—legumes in one row and grasses in another.

Alternate-row seeding of orchardgrass and New Zealand white clover on the Winston Petty farm in the Mt. Angel SCD of Oregon.

"I figure I can add around 500 lbs. of milk per cow per year by keeping about half of my acreage in pasture with the rest in hay and silage in alternate-row seedings. It means I can increase the pasture ration per cow and average 10,000 lbs. of milk per head."

Do cows feed up and down legume rows and skip the grass? Some farmers say yes. To keep cows on a balanced diet, Ellison uses the ration or paddock grazing system. He turns cows on a new strip of alternate rows of legumes and grasses each day, then rests the strip for three weeks before pasturing it again. He likes to put his cows on the pasture when the grasses and legumes are 8 to 10 inches high.

Here's how Ellison puts in his alternate-row seedings:

He plows fields once, disks twice, once in each direction, harrows, and rolls until the ground is firm (in the Mt. Angel SCD area seedbeds must be well prepared and firm). Then he applies 200-300 lbs. per acre of 16% nitrogen and 20% phosphorous fertilizer, harrows it, and rolls it in. Harrowing is done ahead of the roller and in one operation. Sometimes he rolls a field five or six times to firm up the seedbed. He irrigates before working up the seedbed when ground moisture is low.

In seeding, he uses a double box drill and plugs up every other hole in one box and the opposite cup in the other box. Legume seed goes in the grass seed attachment and grass seed in the grain box. Each box is calibrated at the desired rate of planting.

Carroll Ellison, Mt. Angel SCD cooperator, (left) and Mel Rigdon, of SCS, check alternate-row seeding of orchardgrass and Ladino clover on the Ellison farm.

He uses the SCS-recommended mixture of orchardgrass (blue tag), 4-5 lbs. per acre; Ladino clover and New Zealand white clover, 3-4 lbs. When he uses alfalfa for the legume he seeds 5-6 lbs. per acre.

Those who use a drill without a small seed attachment can block off each hole with dividers made from cardboard and held in place with masking tape. Mix enough clover seed for three acres with 27 lbs. of rice hulls and pour into every other compartment. Take another 21 lbs. of rice hulls and mix with amount of grass seed for three acres and put in the opposite holes. Set the drill for 160 lbs. of barley per acre.

Ellison fertilizes according to the appearance and production of a pasture. Usually a season total of 80 pounds of nitrogen and 70-80 pounds of phosphate is applied in split applications.

He keeps cows off a new alternate-row seeding until after the first cutting of hay. He says, "If you can pull grass and it will break off without pulling roots out, it's ready for grazing."

Ellison credits his alternate-row seedings for the steady milk and butterfat gains made by his 20-cow herd. He has made the national honor roll of the Purebred Dairy Cattle Association the last two years.

In 1957 and 1958 the yearly avearge of his herd was 9,829 lbs. of milk and 476.3 lbs. of butterfat per head. That's a gain of 453 lbs. of milk and 21 lbs. of butterfat per head over his yields when he used broadcast-seeded pasture. He made these gains with 10 first-year milking heifers in the herd last year.

Alternate-row seedings take a bit more time and effort than other seedings. But the way some of the first farmers to use this technique have continued to plow out old pastures and put their stake in alternate rows is a pretty good sign that they are a good bet for hay and pasture.

Tree Seeding by Helicopter

By M. P. O'Keefe

THOUSANDS of acres of brushland in Clark County, Washington, may be on the way out in the near future as the result of a short visit by a helicopter which sowed Douglas fir seed over three widely separated small ownerships. Although the amount of land treated is relatively small, only 110 acres, it is felt that a start has been made toward eradicating brush and providing for tree farms in the future in the Clark-Skamania Soil Conservation District.

According to Fred Pratt, county farm forester, there are approximately 112,000 acres in need of reestablishment in the county. The original stands of Douglas fir were logged off and failed to regenerate naturally before brush and hardwoods took over. Most of this land is best suited to timber according to the program of the district.

About 75 percent of this land is in the hands of small-acreage landowners, many of them absentees. The ownership of the land used for these first plantings by helicopter is representative: D. W. Doty is on duty with the U.S. Army in Formosa as a career officer. James Joyce is a missionary in Japan, while William Staninger resides in Oregon. None of the owners were present when portions of their lands were being treated.

Aerial seeding of land to trees by helicopter is not a new idea. Large timber companies have used this time-saving method to reforest in recent years. In the 1956-57 season, more acres were aerial-seeded in western Washington than were planted by any other method. A man can seed 10 acres a day with a cyclone hand seeder; a helicopter can seed seven acres a minute.

The helicopter used in Clark County was operated by a contractor out of Seattle. The contracting company is still experimenting with the use of aerial

Loading seed hoppers on helicopter before taking off for seeding operations.

Helicopter in flight while seeding trees on prepared site.

Note:—The author is soil conservationist, Soil Conservation Service, Vancouver, Wash.

Bulldozer used to scarify ground and brush in preparation for helicopter seeding of Douglas fir.

seeding on small holdings. The December seeding was the first such test in Clark County.

Two tanks which hold 200 pounds of seed each, enough to seed 800 acres, are mounted on two sides of the machine just behind the engine. Distribution is pre-set and the seed fed into a disk-like cylinder near the rear of the ship.

The cylinder is retractible and can be raised when landing and lowered when seeding to prevent damage to seed dispelled rapidly from the cylinder, which makes 1,000 revolutions a minute. Seed striking the landing sleds could be severely damaged.

The helicopter flies at an average altitude of 200 feet and at 45 miles per hour. The seed is broadcast in 80-foot strips with each pass. The rate of application is one-half pound per strip, or around 20,000 seeds per acre. The seed is treated with Endrin to repel rodents, then coated with aluminum flake for identification purposes and to repel birds.

Before seeding, the land must be scarified. Scarification consists of uprooting brush and other competing growth to expose mineral soil. The residue from this operation need not be cleared off the land, windrowed, or burned; it may lie where it falls.

Survival rates have been as high as 16,000 seedlings per acre, according to company reports. A stocking rate of 800 to 1,000, depending on the site, would be adequate. The number of surviving trees can't be guaranteed because of the numerous variables to which all plantings are subject.

The cost to the landowners on the three sites averaged $7.50 an acre. This low cost was possible through Agricultural Conservation Program cost-sharing. Total per-acre costs are $15 for scarifying the land and $9.75 for planting by helicopter, which includes the seed, repellent treatment, and application.

Forestry technicians estimate that planting by helicopter rather than by hand cut costs by two-thirds, and when a stand is established it actually doubles the value of the land.

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According to a recent survey of families living in rural areas of 7 counties in eastern Tennessee, half the rural families were nonfarm families and half were farm families. Of the farm families, more than half had nonfarm income that was greater than their farm sales. Fewer than 1 in 4 of the rural families depended on farming as their major source of income.

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About three-fourths of all workers on the Nation's farms are family workers. USDA figures show that of the 7½ million farm workers last year, only about 1,900,000 were hired workers. These figures compare with twenty years ago, when 2,700,000 of 11 million farm workers were hired workers.

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Phytochrome is the name given to the light-sensitive pigment recently found by ARS scientists to be the triggering mechanism for plant growth.

◆

It takes 115 gallons of water to grow enough wheat to make one loaf of bread.

◆

The sixth annual National Farm-City Week will be observed November 18-24, to promote a better understanding between rural and urban people.

P. E. Johnson, field representative of the contracting company that did the seeding, points to fir seed distributed by helicopter.

Mountain State SCD Leader Says . . .

"Put the Accent on Youth"

By Bernhard A. Roth

"WE need much wider backing for soil conservation's future. To get it, I can't think of a smarter move than to go after our future citizens—right now. Of course, I mean the kids. The best way to enlist them is through teachers who have their confidence."

The words are those of Howard B. Thornburg, Barboursville, W. Va., SCD leader and president of the Cabell County Board of Education for nearly a decade.

"I don't mean we should throw in the sponge on trying to reach adults through the press, radio, TV, and so on. That effort must continue. What I'm talking about is where I foresee the biggest payoff of all: I'm convinced it's with the youngsters and the educators in charge of them."

Thornburg's convictions are all the more impressive in the light of his activities. Erasing ignorance of soil conservation has been a strong theme in his career as a supervisor of the six-county Guyan SCD, Northeast Area vice president of the NASCD, and member of the State Soil Conservation Committee.

His particular pet project is the annual 3-week Conservation Workshop for Teachers held at the State University in Morgantown. "They carry a wonderful story back to the kids and to the communities," says Thornburg. To keep the workshop flourishing and to raise scholarship funds for teachers, he has helped organize conservation education committees in 42 of the 55 counties. A delight for Thornburg in recent times has been an increasing number of $1 and $5 contributions from "just plain ordinary citizens." He believes that the more people the program can touch —in any manner—the rosier soil conservation's prospects will be.

A far-reaching product of the workshop is an 80-page, illustrated guide for teaching resource management, entitled "Living, Learning, Loving West Virginia." Containing handbook material for use all the way from primary through secondary schooling, copies are available in every public classroom in the Mountain State.

Thornburg has specific ideas regarding teachers and soil conservation. "Get them out on the land —let them see what it is—let them know why it is—and invariably they get as fired up about the program as any other subject—often more so. I like to think of our efforts with teachers as smart 'wholesaling.' Get just one of them enthusiastic about the soil and let your imagination dwell on the thousands of kids that one teacher may infect with the same outlook throughout a 20- to 30-year career!"

Looking out across his deep-soiled Guyan Valley bottomland ringed by ancient, wooded hills, longtime dairyman Thornburg likes to philosophize with visitors who

Girl Scouts and friends planting trees at the Girl Scout Camp near Balls Gap, W. Va.

Note:—The author is information specialist, Soil Conservation Service, Upper Darby, Pa.

share his zeal for conservation. "Sometimes I think we overlook how spandy-new our program really is. Twenty-five years is hardly a tick of the clock in history. All the more reason, I figure, to look sharp to the younger crowd. They're the ones who'll change things!"

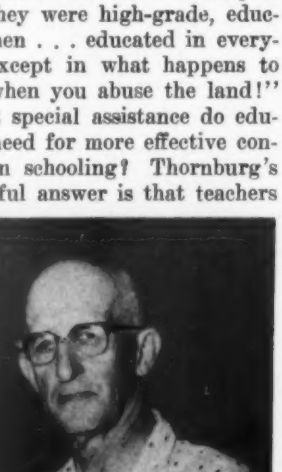
To illustrate, Thornburg describes a meeting he had with engineers of a nearby power plant development in the midst of a coal field near Huntington. Said the engineers: "When we put that plant up—and for a long time afterwards—we could always count on a good head of water all year round. Look at that stream now—flooding today, a mere trickle tomorrow. What in the world's going on?"

Says Thornburg with a grim twinkle: "I took one look around the valley—saw that most of the vegetation had been clear-cut or burned and chewed up with mining operations. It was a sight. So I told them plainly their watershed was 'shot.' In fact, I said what they had left amounted to nothing more than a 'tin roof' . . . Keep in mind they were high-grade, educated men . . . educated in everything except in what happens to water when you abuse the land!"

What special assistance do educators need for more effective conservation schooling? Thornburg's thoughtful answer is that teachers can use much greater quantities of reference materials than they now can lay their hands on. Course outlines, ideas for demonstrations and field trips, comic-book-style pamphlets that amuse and inform youngsters—these are all useful and in short supply, says Thornburg. "But I have a hunch that as soon as we have enough teachers warmed up on the subject, you'll see them scaring up their own materials, or doing a good job of needling others to supply the stuff."

Can he think of any other "secrets" to conservation education? "I believe there is one that can be used up and down the line. I'd select the word 'contact.' Soil conservation needs personal, man-to-man, working contacts with every conceivable segment of public and private interest. "We've got to show clearly that we're not just a bunch of starry-eyed dreamers off in a corner. We've got to make it plain that our 'soil and water' and 'bread and butter' are one and the same. Our county conservation education committees here in West Virginia are beginning to do just that!"

To assure himself that current progress in public understanding will accelerate, Thornburg plans to retain his executive post on the State Conservation Education Council.



Howard B. Thornburg

DISTRICT PROFILE

James E. Nesson of Utah

FOR a fellow starting out with 17 big gullies splitting his grainlands, Utah rancher James E. Nesson has come a long way toward good land use.

Nesson licked the gullies and went on to serve as NASCD Southwest Area Vice President and to become a busy conservation steward of the land. He has found these experiences stimulating and challenging.

Today, his 400-acre wheat and fallow land is one of several well-kept farms in the Howell community of Box Elder County.

A persevering leader in spreading the gospel of good land use, Nesson has inherited much of the pioneering vigor of his father, Nephi.

In 1909, young settler Nephi moved to the wide, open spaces of Howell where he broke the present farm out of sagebrush and sowed it to grain.

Nephi had his ups and downs in farming and there were lean and good crop years before he turned over the holdings to son Jim.

"The Soil Conservation Service helped me work out a farm plan soon after I took over the land," Jim explains. "The plan looked good on paper but it took some prodding from my neighbor, Carl

James E. Nesson.

Shriber, before I got around to really working the plan."

A member of the Flying Farmers of America, Jim Nesson began spotting his soil and water problems from above, an acre-by-acre reconnaissance which speeded up the job of safeguarding and improving his lands. Aerial spotting worked out so well he piloted his neighbors on hops over their lands.

The Howell rancher took to the air many times to photograph and keep tab on the progress of his conservation work.

He was among the first ranchers in Box Elder County to fall-till and chisel his lands to store up added moisture, reduce soil losses, and lessen frost damage.

Nesson likes contour stripcropping as an erosion buffer on his sloping grainlands. And he's thoroughly sold on stubble mulching ("haven't plowed my land since '47") as a good soil and water saver.

Heavy applications of chicken manure and commercial nitrogen fertilizer spread on his wheatlands increased the average protein rate from 10.5% to 13%.

Being a conservation farmer is a full-time job. Still Nesson finds time to give leadership to several of the major soil and water activities of his community and State.

Besides serving as an NASCD area vice president, he is a supervisor of the Northern Utah Soil Conservation District and chairman of the committee sponsoring the Blue Creek-Howell Watershed project.

In his own community, he has been treasurer of the town board for many years and has always been an active churchman.

Nesson has done a lot of forward-thinking on urban sprawl. He says, "It's a shame to see so much of our top farm and ranch lands go into urban uses. There'll come a day when our people will wish they had that good land in crops."

—Evan C. Thompson

Continuous Corn Needs Proper Management

The increasing popularity of continuous corn has caused many farmers to rush blindly into this program. Before taking this step, they might take a look at the lesson taught by the Morrow Plots, the oldest soil experiment field in America, located on the University of Illinois campus at Urbana.

One section has grown corn continuously for 84 years. Part of the continuous corn area has received no soil treatment during the entire period. This area yielded 26 bushels in 1959.

A new management program including liming, thicker plant population, and heavy fertilization was put into effect on part of the untreated area in 1955. The yield immediately shot up to 86 bushels, an increase of 50 bushels over that on the untreated area. Three years with yields of over 100 bushels followed. All four of these years were favorable for corn.

The dry season of 1959 taught an important lesson. The yield on the newly treated area dropped to 56 bushels. All of the plots showed lower yields, but none were so serious as on this area.

Much of the decrease in yield can be explained by the organic-matter content of the soil. The plot is very low in organic matter. Although nutrients were supplied after 1954, the tilth is still very poor. This soil was not able to store and furnish enough water for the corn during the dry year of 1959. A great reduction in yield resulted.

Another section of the continuous corn plot has received manure, lime, and phosphate since 1904. This area yielded 83 bushels of corn in 1959. The difference illustrates the importance of management in a continuous corn program.

Continuous corn has other drawbacks. Maintaining soil fertility costs much more. Continuous corn will remove a greater amount of nutrients than will a rotation containing legumes. Legumes add nitrogen from the air, while commercial nitrogen must be added to continuous corn.

A great amount of risk is involved in the all-corn operation. If corn borers, dry weather, hail, or low corn prices present themselves, the continuous corn farmer could get hit hard financially. But if the operator has other crops besides corn, probably at least one of his crops will come through and make a profit for him.

THE SOIL AND ITS FERTILITY. By Henry Teuscher and Rudolph Adler, with the collaboration of Jerome P. Seaton. 446 pp. 1960. Reinhold Publishing Corporation: New York. $12.

The cover of this big book suggests a welcome surprise—a book on soils by Canadian authors. But alas, the book deals only tangentially with soils and makes little use of the rich Canadian experience in soil research and management. The writing has the musty odor of Liebig's laboratory and of old library shelves.

The text is a curious mixture of much old and some new material from inorganic and biological chemistry, fertilizer technology, plant physiology, genetics, biology of soils, agronomy, horticulture, history, and soil science. It has a good deal about chemical processes that do, could, or might go on within plants, soils, and rocks.

Of the many "soil types" (great soil groups), four are discussed: Podsols, Chernozem, Rendzina, and "laterite" (*sic*). Why these particular ones and no more is unclear. The authors explain on page 10 that ". . . different types can be

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defined only in large groups, and, the smaller the subdivisions become, the less well defined can they be . . ." This logic clearly antedates John Stuart Mill.

Only a little is said about erosion, but that little is forceful. Even in western Europe during the Dark Ages "the invaluable topsoil, deprived of saving humus, was washed away in large-scale erosion."

Further, on page 144: "It has been estimated that approximately 282 million acres of farmland have been ruined and another 775 million acres have been seriously damaged through erosion in the United States alone." But there the matter is dropped as if that were the end of the story, except for an admonition that farmers should change their outlook! Little or nothing is said about the enormous improvements of the past 25 years—nor how they were achieved.

A large number of items known to be important to soil productivity are mentioned. So are a large number that are a bit speculative or remote from the title, including agrobiology, Baule units, vitamins, plant mutations by treatment with mustard oil, the infinitesimal calculus, and poisonous humus.

The index is a bit sketchy.

The book is not suggested for a personal library supported by a modest budget.

—CHARLES E. KELLOGG

ADVENTURES IN ECOLOGY: HALF A MILLION MILES: FROM MUD TO MACADAM. By Edith S. Clements. 244 pp. Illus. 1960. Pageant Press, Inc.: New York. $5.

Two outstanding scientists who made lifelong careers studying plants in their environment were Frederic E. Clements and his wife Edith S. Clements. For years this illustrious husband-and-wife team worked as research ecologists for the Carnegie Institute of Washington, D. C. Starting at Carnegie's Desert Laboratory at Tucson, Ariz., they later transferred to an outdoor winter laboratory at Santa Barbara, Calif., and summered at their mountain gardens on Pike's Peak adjacent to the famous cog-road between Manitou, Colo., and the mountain summit.

Frederic and Edith Clements studied continuously the Great Plains and mountain vegetation, and their classic ventures over the crooked, uncharted desert and mountain roads make an interesting chapter in pioneer western American history. Their books on plant ecology and botany have been standard texts for several decades. Frederic died in 1945, but Mrs. Clements still carries on actively.

Fortunately author-artist Edith Clements has just published a charming written account of her experiences. She is a witty storyteller, and the numerous tragicomic experiences of the ecologist on wheels come off as humorous episodes. Being stuck in a muddy desert wash or being helplessly high-centered on a mountain road wasn't funny at the time, but the author presents the post-comic features of such experiences with the mirth of a philosophic motorist. She painlessly sneaks in vital facts about ecology which are delightfully informative.

The Clements are old friends of the Soil Conservation Service, having served as Service advisors in conservation ecology for many years. A considerable part of the book is given over to their early conservation work and their field experiences with many Soil Conservation Service personnel.

—B. W. ALLRED

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A memorial fund honoring the late Hugh H. Bennett is being established in the form of donations to the new Soil Conservation Society of America headquarters building to be erected in the vicinity of Des Moines, Iowa. The new building will have a "Hugh Bennett Room," which will contain his portrait and writings.

◆

The National Association of Soil Conservation Districts has announced that the Soil Conservation District Foundation has received several contributions to the Foundation in the name of Dr. H. H. Bennett, since his death in July.

◆

Total water use in the United States quadrupled from 1900 to 1950. It is expected to double again by 1975.